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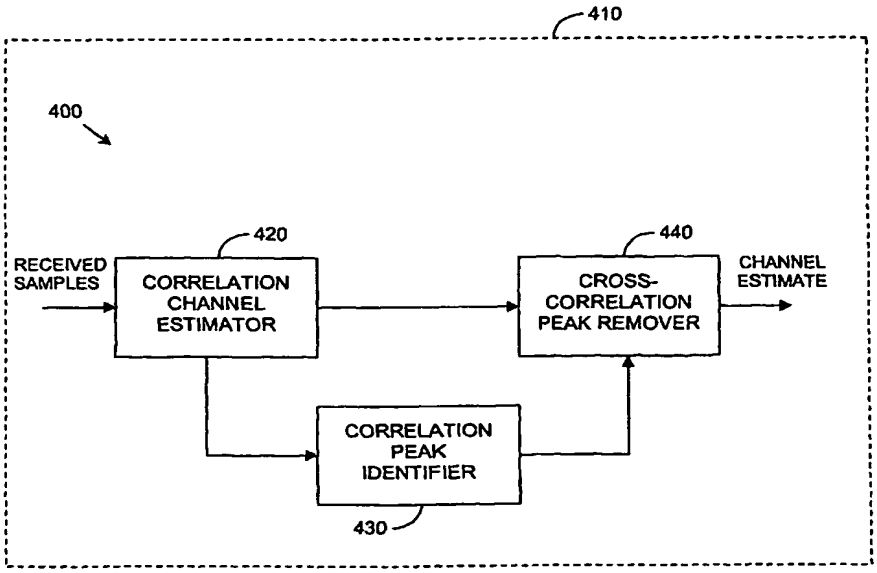
Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,*

[Continued on next page]

(54) Title: METHOD AND ARRANGEMENT FOR CHANNEL ESTIMATION IN A WIRELESS COMMUNICATION SYSTEM



(57) Abstract: A method and arrangement (100) for PRACH burst channel detection in a UTRA TDD wireless communication system in which training sequences are constructed from a single periodic base code. Unwanted cross-correlation peaks, having magnitude less than correlation peaks, are removed (440) from the correlator outputs, maintaining optimal signal-to-noise ratio of the channel estimates, providing a low probability of false detection, and extending the cell size of a CDMA network to that determined by the guard period duration. The cell size can be extended further by ensuring that no transmissions are scheduled for the timeslot subsequent to that in which the channel estimation bursts are scheduled.

WO 2004/039098 A3

MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

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INTERNATIONAL SEARCH REPORT

ional Application No
PCT/GB 03/04587

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L25/02 H04L7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/126220 A1 (ATUNGSIRI SAMUEL ASANGBENG ET AL) 12 September 2002 (2002-09-12) paragraph '0045! - paragraph '0049! paragraph '0055! - paragraph '0058!	1,2,8,9, 15-18, 20-22
Y		3-7, 10-14

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 March 2004	11 JUN 2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Koukourlis, S

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 03/04587

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	STEINER B ET AL: "OPTIMUM AND SUBOPTIMUM CHANNEL ESTIMATION FOR THE UPLINK OF CDMA MOBILE RADIO SYSTEMS WITH JOINT DETECTION" EUROPEAN TRANSACTIONS ON TELECOMMUNICATIONS AND RELATED TECHNOLOGIES, AEI, MILANO, IT, vol. 5, no. 1, 1994, pages 39-50, XP000445714 ISSN: 1120-3862 page 42, right-hand column, paragraph 2 - page 45, left-hand column, paragraph 1	3-7, 10-14
Y	MING LEI ET AL: "Channel estimation based on Midamble in UTRA-TDD system" PROCEEDING OF THE INTERNATIONAL CONFERENCE ON TELECOMMUNICATIONS, ICT 2002 - INTERNATIONAL CONFERENCE ON TELECOMMUNICATIONS, BEIJING, CHINA, 23-26 JUNE 2002, pages 434-438 vol.2, XP008028023 2002, Beijing, China, Publishing House of Electronics Industry, China the whole document	3-7, 10-14
A	WO 02/082705 A (HO SHUI MING JOSEPH ;DAOBEN LI (CN); LINKAIR COMMUNICATIONS INC (U) 17 October 2002 (2002-10-17) page 15, line 18 - page 16, line 9	18
A	EP 0 827 295 A (SIEMENS AG) 4 March 1998 (1998-03-04) column 1, paragraph 1 - column 2	18
A	US 5 627 823 A (PILLEKAMP KLAUS-DIETER) 6 May 1997 (1997-05-06) column 1, line 24 - column 2, line 3	18
A	HOSUR S ET AL: "Design of cyclically permutable codes for PN code acquisition in WCDMA TDD mode" IEEE 52ND VEHICULAR TECHNOLOGY CONFERENCE (CAT. NO.00CH37152), 24 September 2000 (2000-09-24), - 28 September 2000 (2000-09-28) pages 581-587 vol.2, XP010525450 2000, Piscataway, NJ, USA, IEEE, USA ISBN: 0-7803-6507-0 the whole document	1-18, 20-22

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 03/04587

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KOUKOURLIS S S ET AL: "On the capacity of an FFH-CDMA packet radio network" IEEE TRANSACTIONS ON BROADCASTING, MARCH 1995, USA, vol. 41, no. 1, pages 17-22, XP002272652 ISSN: 0018-9316 page 17, paragraph 2 - page 18, paragraph 1	1-18, 20-22

INTERNATIONAL SEARCH REPORT

national application No.
PCT/GB 03/04587

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-18, 20-22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-18, 20-22

   Method and device for channel estimation involving cross-correlation peak removal.

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2. claim: 19

   Method for channel estimation according to which no transmission occurs in a timeslot immediately following that in which channel estimation is performed.

INTERNATIONAL SEARCH REPORT

ɔnal Application No
PCT/GB 03/04587

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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